Incubator reject eggs as a protein supplement in the diets of broilers

S. A. Babiker, S. E. ElSammani and E. B. Ismail

Faculty of Animal Production, University of Khartoum, P. 0. Box 32, Khartoum North, Sudan

SUMMARY

Substitution of air dried whole egg powder protein for commercial super concentrate mix protein in broiler diets reduce live weight gain and final body weight, but the reduction was only significant *(P < 0.5)* at the highest level of inclusion (75%). Similarly, food intake and feed conversion efficiency were reduced, but not significantly. Eviscerated carcass weight was significantly reduced *(P < 0.05)* and dressing percentage was reduced when the inclusion level of air dried incubator eggs protein reached 75% only. A significant increase *(P < 0.5)* in the weights of abdominal viscera, head and shanks was also observed.

INTRODUCTION

The high cost of importation of animal proteins as fish meal and commercial poultry super concentrate mixes limits poultry production in developing countries with financial constraints. Poultry by-product meal is a valuable ingredient in broiler diets

with growth promoting properties similar to fish meal (Wisman *et al.*, 1958).

Reports indicated that feather meal alone can be used as a protein source in chick and broiler diets up to 25% of the protein requirement (Summers *et al.*, 1965) Jackson and Fulton (1971) found that feather and offal meal could be used up to a level of 10% as a replacement of fish meal in broiler diets. Above that level, the lower nitrogen digestibility and the poor lysine and methionine as well as the high cystine content, limited the usage of poultry offal meal. Similarly, Bhargava and 0 Neil (1975) found that addition of 10% poultry by-product and hydrolysed feather meal to broiler diets had no adverse effect on body weight and feed conversion efficiency of chicks, but significantly depressed growth and adversely affected feed efficiency at an inclusion level of either 15 or 20%. On the other hand, Escalona and Pesti (1987) indicated that chick growth and feed efficiency were significantly depressed when poultry by-product meal was incorporated at 10% level in broiler control corn and soya bean basal diet while at 5% level, gain and feed efficiency were comparable to the control diet. Whole dried egg powder, obtained from egg unsuitable for incubation, were found to induce satisfactory growth when included in broiler diets at a level of 20% (Mast 1981). In regions with specialized poultry industry incubator reject eggs and other poultry by-products are sent to the rendering plant for the manufacture of poultry by-product meal. However, in some of the developing countries small poultry farms with no rendering facilities predominate.

Here incubator reject eggs and other poultry by-products are not utilized. Literature on usage of incubator reject eggs in poultry feeding is lacking. In this study, incubator rejects (eggs at day 18 of incubation) were used as a replacer of the protein supplied by super concentrate mix at levels of 25, 50 and 75% with the objective of reducing diet cost in poultry farms having no rendering plants.

MATERIAL AND METHODS

240 day-old unsexed broiler chicks were randomised into 24 groups of similar number and weight. The groups were then allocated to four treatments, each with six replicates. Each replicate was kept in a pen (lx 1m) provided with a tubular feeder and a fountain drinker. Incubator rejects (eggs at day 18 of incubation) were coagulated by boiling in water for 15 minutes, minced and air dried at ambient temperature. The product was thoroughly hand mixed and the mixture was designated air dried incubator reject eggs protein. This eggs protein was incorporated into four broiler basal diets to replace different levels of the protein supplied by the super concentrate premix. In diets A, B and C air dried incubator reject eggs protein respectively replaced 25% , 50% and 75% of the super concentrate premix protein, while diet D was the control. The four dietary treatments were adjusted to be isoenergetic and isonitrogenous, (Table 1).

Diets in mash form and water were supplied ad libitum. Feed intake was recorded daily and consumption data were daily

adjusted to account for any deaths in chicks. Liveweight was taken weekly and before feeding.

Table 1: Diets Formulae and their calculated composition.

Ingredients (%)	Diets			
			A	
Sorghum grains	55.5	55.5	53.5	55.5
Groundnut cake	34.5	34.5	35.0	34.5
Wheat bran	1.39	1.54	3.25	1.25
Superconcentrate mixa	4.60	3.13	1.56	6.25
Egg powderb	1.42	2.83	4.25	-
Ca CO3	1.25	1.25	1.25	1.25
Salt	0.25	0.25	0.25	0.25
Calculated composition (as fed):				
Metabolizable energy (MJ/kg^{-1})	12.1	12.3	12.3	12.0
Crude protein % (Nx6.25)	25.6	25.7	25.9	25.6

a Super concentrate mix supplied 12.1 MJ/kg -1 ME; 37% CP, 7.5% Ca; 5.4% P; 8.4% Lysine and 2.5% Methionine.
b Egg powder supplied 48% CP; 40.23% fat and 4.63% ash 12.08 MJ/Kg.

At the end of the 8th week, birds were individually weighed after an overnight fast (except for water) and slaughtered without

stunning. Birds were then scalded, manually plucked, washed and allowed to drain on a wooden table. Evisceration was performed by a ventral cut and visceral as well as thoracic organs were removed. After evisceration, internal organs, heads and shanks were weighed individually and expressed as percentages of slaughter weight.

Eviscerated carcasses were weighed and then chilled in a refrigerator for 12 hours at 4 degrees centigrade, cold carcasses weights were recorded. Five carcasses were randomly selected from each pen for dissection. The right-side was dissected into meat (including muscles, skin, tendons and fat) and bone. Each carcass component was expressed as percentage of carcass side weight . Data were statistically analysed according to Snedecor and Cochran (1980).

RESULTS

Chick performance

Replacement of super concentrate premix protein with air dried incubator reject eggs protein up to 50% had no significant effect on the final weight in comparison with control (Table 2). Only in group C where air dried incubator reject eggs protein replaced 75% of the super concentrate premix protein was final body weight significantly reduced (P < 0.01). Live weight gain showed the same pattern of change as final weight. it was significantly reduced (P < 0.01) at the highest level of replacement (75%) .

Food intake, though, not significantly different among the various dietary groups was lower in the groups fed diets containing air dried incubator reject eggs protein than in controls. In group C where air dried incubator reject eggs protein replaced 75% of the super concentrate premix protein had the least food intake.

Substitution of super concentrate mix protein with air dried incubator reject eggs proteins had no significant effect on feed conversion efficiency (Table 2). Slight reduction in feed conversion efficiency was noticed at 75% level of replacement .

Table 2. Performance of broiler chickens

	Diets				
		B	C	D	SE
Number of chicks	60	60	60	60	
Initial chick weight (g)	41.60	41.70	41.50	41.60	0.42
Final weight (g)	2211.40a	2199.95a	1139.40b	2200.10a	52.39
Liveweight gain (g)	2169.78c	2158.33c	1835.32d	2158.50c	70.62
Food intake (g)	4909.74	4730.60	4540.85	5057.75	140.92
Food conversion efficiency: (g feed g liveweight gain)	2.24	2.24	2.52	2.36	0.09

a, b, c, and d *(P* < 0.01) : means on the same line with unlike superscript differ significantly.

Carcass yield and characteristics

As seen in Table 3, slaughter weight was significantly lighter *(P* < 0.05) in group C where air dried incubator reject eggs protein replaced 75% of the super concentrate premix protein. Cold eviscerated carcass weight was significantly lighter *(P* < 0.001) in the group raised on diet C containing 75% air dried incubator reject eggs protein. Birds raised on diets containing 25% , 50% or no air dried incubator reject eggs powder protein (control) had similar eviscerated carcass weights. Dressing percentage showed the same trend as eviscerated carcass weight. Carcass side muscles and bones were not significantly different among the various treatment groups.

Table 3. Carcass yield and characteristics of broiler chickens.

	Diets				
	A	B		D	**SE**
Slaughter weight (g)	2172.0a	2239.0a	1964.9b	2210.8a	56.91
Cold eviscerated carcass weight (g)	1496.9c	1492.7c	1285.9d	1504.3c	35.78
Dressing percentage (%)	68.9a	68.0a	64.9b	68.0a	0.92
Carcass side muscle (%)	76.4	76.7	76.3	76.1	0.66
Carcass side bone (%	23.4	23.0	22.5	24.2	0.66

a, b ***(P* <** 0.05) and c, d ***(P* <** 0.01) **means on the same line with** unlike superscri t differ significantly.

Organ proportion of broiler chickens

Data comparing organ proportion of broiler chickens are given in Table 4. Head and shanks were significantly heavier *(P <* 0.05) total viscera was heavier and abdominal fat was significantly lighter *(P <* 0.05), and intestines were significantly heavier *(P <* 0.01) in birds raised on diet C where air dried incubator reject eggs protein replaced 75% of the super concentrate mix protein than in other dietary treatments. Liver, heart and gizzard were not significantly different among the various dietary groups.

Table 4. Organ proportion of broiler chicken (Slaughter weight %)

	Diets				
	A	B	C	D	SE
Head and shanks	7.5a	7.2b	7.8b	7.1a	0.16
Total viscera	12.6	12.7	13.6	12.7	0.44
Abdominal fat	1.9a	1.6a	1.1b	1.5a	0.11
Liver	1.9	2.1	2.1	2.0	0.07
Heart	0.6	0.6	0.6	0.5	0.10
Gizzard	1.7	1.7	1.7	1.7	0.04
Intestines	5.3c	5.5c	6.7d	5.2c	0.15

a, b (***P*** < 0.05) and c, d (***P*** < 0.01) : means on the same line with unlike superscript differ significantly.

DISCUSSION

Chick performance

The observed reduction in liNe weight gain **and final body weight when air** dried incubator **reject eggs protein replaced 75%**

of the super concentrate premix protein in broiler diets might be attribuicd to a reduction in feed intake, (Table 2) and or to biotin deficiency. Mast (1987) found that broilers fed diets containing 20% dried whole egg powder without biotin enrichment weighed 35-40g less than birds fed the same diet enriched with biotin. In

addition to that, lysine and methi„nine deficiency (Jackson and Fulton, 1971) might also be responsible for the observed reduction in growth rate. Incorporation of air dried incubator reject eggs protein in broilers diets reduced feed intake and the reduction was only significant at the highest level of inclusion *(75%)*. Diet palatability as well as digestibility (Jackson and Fulton, 1971) might be responsible for this reduced feed intake.

Feed conversion efficiency was only reduced at 75% level of replacement (Table 2). This coincided with the significant reduction ($P < 0.01$) in live weight gain at this level of inclusion which might possibly be responsible for the reduction in feed conversion efficiency.

Carcass characteristics and body components

The fact that slaughter weight was significantly lighter ($P < 0.05$) when air dried incubator reject eggs protein replaced 75% of the super concentrate mix protein was a consequence of the significantly ($P < 0.001$) reduced growth rate of this group (Table 2). The latter phenomenon was also responsible for the lighter eviscerate carcass weight of this group. High air dried incubator reject eggs protein replacement level (75%) was found to associate with heavy weights of head and shank, total viscera and intestines coupled with lighter carcass weights.

These explained the significant reduction in dressing percentage of the birds raised on this diet (group C).

The heavier weights of head and shanks, total viscera and intestines could be attributed to the fact that the carcass tissue increased at a lower rate than these body components. Earlier, Crawley *et al.,* (1980) and Mitchell *et al.* (1926, 1932) indicated that the percentage weight of viscera decreased with an increase in bird weight.

REFERENCES

Bhargava, K. K. and 0. Neil, J. B. (1975). Composition and Utilization of poultry by-products and hydrolysed feather meal in broiler diets. Poultry Sci,. 54, : 1511-1518.

Crawley, S. W., Sloan, D. R. and Hale, K. K. (1980). Yields and Composition of edible and inedible by-products of broilers processed at 6, 7 and 8 weeks of age. Poultry Sci. , 59: 2243-2246.

Escalona, R. R. and Pesti, G. M. (1987). Nutritive value of poultry by-product meal. 3. Incorporation into practical diets. Poultry Sci., 66, 1067-1070.

Jackson, N. and Fulton, R. B. (1971). Composition of feather and offal meal and its value as a protein supplement in the diet of broilers. J. Sci., Food., Agric. 22 : 38-42.

Mast, G. (1987). Loss eggs should be more fully utilized. Poultry International, 11-13.

Mitchell, H. H., Card, L. E. and Hamilton, T. S. (1931). A technical study of the growth of white plymouth Rock

chickens. Agri. Exp. Sta. Bull. No. 36. Univ. of Illinois Urbana, 11.

Mitchell, H. H., Cerd, L. E. and Hamilton, T. S. (1926). The growth of white plymouth Rock chickens. Agri. Exp. Sta. Bull. No. 278. Univ. of Illinois, Urbana 11.

Snedecor, G. W. and Cochran, W. G. (1980). Statistical Methods. 7th ed. Iowa State Univ. Press, Ames, la.

Summers, J. D., Slinger, S. J. and Ashton, G. C. (1965). Can. Sci. 45, 63. Cited by Jackson, N. and Fulton, R. B. (1971) J. Sci. Food, Agric., 22:38-42.

Wisman, E. L., Homes, C. E. and Engel, R. W. (1958). Utilization of poultry by-product in poultry rations. Poultry Sci. 37: 834-838.